CLAIMS

1. A method for determining a load exerted on a tyre fitted on a vehicle during a running of said vehicle on a rolling surface, the tyre comprising an equatorial plane, the method comprising the steps of:
   - providing a concave upwards function $F_z = F_z(PL_c)$ of said tyre load versus a length of a contact region between said tyre and said rolling surface;
   - estimating said length (PL_c) substantially at the equatorial plane; and
   - deriving the tyre load corresponding to said estimated length from said function.

2. A method according to claim 1, characterized in that said function is a polynomial function of degree at least two of said length.

3. A method according to claim 1, characterized in that said function is $F_z = \frac{-B+\sqrt{B^2-4A(C-PL_c)}}{2A}$, wherein A, B and C are fit coefficients related to a structure of said tyre.

4. A method according to claim 1, characterized in that said function is $F_Z = A1 \cdot \tan(B1 \cdot PL_C)$, wherein A1 and B1 are fit coefficients related to a structure of said tyre.

5. A method according to any of claims 1-4, characterized in that said step of estimating said length (PL_c) comprises the step of acquiring an acceleration signal.

6. A method according to claim 5, characterized by further comprising a step of low-pass filtering said acceleration signal.

7. A method according to claim 5 or 6, characterized in that said step of acquiring an acceleration signal comprises acquiring a tangential acceleration signal.

8. A method according to claim 7, characterized in that the step of estimating said length comprises measuring a distance between a maximum value and a minimum value of said tangential acceleration signal.

9. A method according to claim 5 or 6, characterized in that said step of acquiring an acceleration signal comprises acquiring a radial acceleration signal.

10. A method according to claim 7, characterized in that the step of estimating said length comprises measuring a distance between two maxima of said radial acceleration signal.

11. A method of controlling a vehicle having at least one tyre fitted thereon, comprising:
   - estimating a load exerted on said tyre by a method according to any one of the previous claims;
   - passing said estimated load to a vehicle control system of the vehicle;
   - adjusting at least one parameter in said vehicle control system based on said estimated load.

12. A method according to claim 11, characterized in that said vehicle control system comprises a brake control system, and in that said step of adjusting at least one parameter comprises adjusting a braking force on said tyre.

13. A method according to claims 11 or 12, characterized in that said vehicle control system comprises a steering control system, and in that said step of adjusting at least one parameter comprises selecting a maximum variation allowed from steering commands.

14. A method according to any one of claims 11 to 13, characterized in that said vehicle control system comprises a suspension control system, and in that said step of adjusting at least one parameter

comprises adjusting a stiffness of a suspension spring associated to said tyre.

15. A method according to any one of claims 11 to 14, characterized in that said vehicle comprises at least one tyre fitted on its right and at least one tyre fitted on its left, said vehicle control system comprises an active roll control system, and in that said step of adjusting at least one parameter comprises compensating an unequal load distribution between said left fitted tyre and said right fitted tyre.

16. A system for determining a load exerted on a tyre fitted on a vehicle during a running of said vehicle on a rolling surface, the system comprising:

- a measuring device adapted to estimate a length (PL_c) of a contact region between said tyre and said rolling surface substantially at the equatorial plane; and
- at least one processing unit being adapted to derive the tyre load corresponding to said estimated length from a concave upwards function $F_z = F_z(PL_c)$ of said tyre load versus the length of contact region between said tyre and said rolling surface.

17. A system according to claim 15, characterized in that said function is a polynomial function of degree at least two of said length.

18. A system according to claim 15, characterized in that said function is $F_z = \dfrac{-B+\sqrt{B^2-4A(C-PL_c)}}{2A}$, wherein A, B and C are fit coefficients related to the structure of said tyre.

19. A system according to claim 15, characterized in that said function is $F_Z = A1 \cdot \tan(B1 \cdot PL_C)$, wherein A1 and B1 are fit coefficients related to a structure of said tyre.

20. A system according to any of claims 16-19, characterized in that said measuring device comprises a tangential or a radial accelerometer producing a corresponding acceleration signal.

21. A system according to claim 20, characterized in that said measuring device comprises a sampling device adapted to sample said signal at a frequency of at least 5 kHz.

22. A system according to claim 21, characterized in that said sampling device is adapted to sample said signal at a frequency of at least 7 kHz.

23. A system according to any one of claims 16 to 22, characterized in that it further comprises at least one memory associated to said processing unit.

24. A system according to claim 23, characterized in that said at least one memory comprises pre-stored characteristic functions describing vertical tyre loads versus contact region lengths.

25. A system according to any one of claims 23 to 24, characterized in that said at least one memory comprises pre-stored instructions for said processing unit.

26. A system according to any one of claims 16 to 25, characterized in that said measuring device is included in a sensor device located in a tread area portion of said tyre.

27. A system according to claim 26, characterized in that said sensor device is secured to an inner liner of the tyre.

28. A system according to claim 27, characterized in that it comprises a damping element between said sensor and said inner liner.

29. A system according to any one of claims 25 to 28, characterized in that said sensor device further includes a transmitting device.

30. A system according to claim 29, characterized in that said transmitting device is operatively connected to a first antenna.

31. A system according to any one of claims 20 to 30, characterized in that it further comprises a filtering device adapted for low-pass filtering said signals.
32. A system according to any one of claims 26 to 31, characterized in that said sensor further comprises a power source.
33. A system according to claim 32, characterized in that said power source comprises a battery.
34. A system according to claim 32, characterized in that said power source comprises a self-powering device, being adapted to generate electrical power as a result of mechanical stresses undergone by said sensor device during running of said vehicle.
35. A system according to claim 34, characterized in that said self-powering device comprises a piezoelectric element.
36. A system according to claim 34 or 35, characterized in that said self-powering device comprises an electrical storage circuit.
37. A system according to claim 36, characterized in that said electrical storage circuit comprises a resistor and a capacitor.
38. A system according to any one of claims 18 to 37, characterized in that said processing unit is included within said sensor device.